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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/684,502	10/15/2003	Tomoyo Yamaguchi	244071US2	4605

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EXAMINER	
CHEN, KIN CHAN	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 05/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/684,502	YAMAGUCHI, TOMOYO	
	Examiner	Art Unit	
	Kin-Chan Chen	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-28 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-28 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Li et al. (US 6,670,278; hereinafter "Li").

In a method for plasma treatment, Li teaches that a substrate including a SiC layer and a SiO_2 layer may be arranged in a chamber. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3. SiO_2 may be a mask layer on the SiC layer. SiO_2 may be a base layer of the SiC layer (col. 4, line 62 through col. 5, line 1; col. 5, lines 23-30. col. 6, lines 8-45).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (US 6,670,278; hereinafter "Li") as evidenced by Demmin (US 6,635,185).

In a method for plasma treatment, Li teaches that a substrate including a SiC layer and a SiO_2 layer may be arranged in a chamber. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3. SiO_2 may be a mask layer on the SiC layer. SiO_2 may be a base layer of the SiC layer. Li teaches that the substrate may include an organic layer. Li teaches that the organic layer may be a base layer of the SiC layer. See col. 4, line 62 through col. 5, line 1; col. 5, lines 23-30; col. 6, lines 8-45.

Li teaches that the inert gas such as Ar may be added to the etching gas. Other inert gas can be substituted for Ar. Hence, it would have been obvious to one with ordinary skill in the art to use nitrogen because it is one of the most popular inert gases used in the art of plasma etching.

The above-cited claims differ from Li by specifying various compositions and processing parameters (such as ratios of flow rates of etchants in claims 6, 7, 9, 11,15, and 16). However, same were known to be result effective variables and commonly determined by routine experiment. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality, it is the examiner's position that a person having ordinary

skill in the art at the time of the claimed invention would have found it obvious to modify Li by performing routine experiments by using various compositions and different processing parameters to obtain optimal result. See Demmin (US 6,635,185) in the record as evidence.

Claim Rejections - 35 USC § 102

5. Claims 1, 2, 4, 5, and 8 are rejected under 35 U.S.C. 102(a) as being anticipated by Nishizawa (US 6,617,244).

In a method for plasma treatment, Nishizawa teaches that a substrate including a SiC layer and a SiO_2 layer may be arranged in a chamber. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3. SiO_2 may be a mask layer on the SiC layer. The etching gas may include nitrogen. (col. 5, lines 58-60; col. 6, lines 53-55; Fig. 2B).

Claim Rejections - 35 USC § 103

6. Claims 18-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. (US5,958,793; hereinafter "Patel") in view of Nishizawa (US 6,617,244).

In a method for plasma treatment, Patel teaches that a substrate including a SiC layer. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3 and free from any material having O. Patel teaches that the substrate may include glass or other materials. The

disclosure of Patel is not limited to a particular substrate. Hence, it would have been obvious to one with ordinary skill in the art to use organic dielectric (low-K material), silicon oxide, or metal (e.g., copper) because they are well-known substrates being used in the art of semiconductor device fabrication. See abstract; col.1, lines 14-17, 25-27; col. 2, lines 10-19.

The claimed invention differs from the Patel by specifying adding nitrogen to the etchant. However, it is known that nitrogen may be added to the etchant to improve the uniformity of etching. Nishizawa is only relied on to show that nitrogen may be added to the etchant to effectively etch SiC (see col. 8, lines 60-67). Hence, it would have been obvious to one with ordinary skill in the art to use nitrogen as taught by Nishizawa in the process of Patel in order to effectively etch SiC.

7. Claims 18-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. (US 5,958,793; hereinafter "Patel") as evidenced by Li et al. (US 6,009,830) and Witek et al. (US 5,627,395).

In a method for plasma treatment, Patel teaches that a substrate including a SiC layer. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3 and free from material having O. Patel teaches that the substrate may include glass or other materials. The disclosure of Patel is not limited to a particular substrate. Hence, it would have been obvious to one with ordinary skill in the art to use organic dielectric (low-K material), silicon oxide, or metal (e.g., copper) because they are well-known substrates being used in the art of

semiconductor device fabrication. See abstract; col.1, lines 14-17, 25-27; col. 2, lines 10-19.

The claimed invention differs from the Patel by specifying adding nitrogen to the etcahnt. However, it is known that inactive gas such as Ar, or N_2 may be added to the etchant to improve the uniformity of etching. See Li et al. (US 6,009,830; col. 1, lines 33-45) and Witek et al. (US 5,627,395; col. 5, lines 31-33) in the record as evidences. Hence, it would have been obvious to one with ordinary skill in the art to use inert (inactive) gas such as nitrogen in the plasma etching process in order to improve the uniformity of etching.

8. Claims 18-20, 22, 23, 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nemani et al. (US 6,764,958; hereinafter "Nemani") as evidenced by Li et al. (US 6,009,830) and Witek et al. (US 5,627,395).

In a method for plasma treatment, Nemani teaches that a substrate including a SiC layer. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3 and free from any material having O. Nemani teaches that the substrate may include an oxide layer (e.g., SiO_2) or a metal (e.g., copper) layer. See col. 7, lines 44 through col. 8, line 59).

The claimed invention differs from the Nemani by specifying adding nitrogen to the etcahnt. However, it is known that inactive gas such as Ar, or N_2 may be added to the etchant to improve the uniformity of etching. See Li et al. (US 6,009,830; col. 1, lines 33-45) and Witek et al. (US 5,627,395; col. 5, lines 31-33) in the record as evidences.

Hence, it would have been obvious to one with ordinary skill in the art to use inert (inactive) gas such as nitrogen in the plasma etching process in order to improve the uniformity of etching.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Demmin (US 6,635,185; Col. 7, lines 5-25) teaches that one skilled in the art of plasma etching and cleaning may vary type of plasma etching (RIE, HDP, plasma etching..), composition, flow rate, temperature, pressure, power, time, bias accordingly to etch a desired material satisfactorily. Li et al. (US 6,009,830; col. 1, lines 33-45) and Witek et al. (US 5,627,395; col. 5, lines 31-33) teach that inactive gas such as Ar, or N_2 may be added to the etchant to improve the uniformity of etching.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status

information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

May 12, 2005

Kin-Chan Chen
Primary Examiner
Art Unit 1765